

CLAIMS

1. An arrangement for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said arrangement comprising:
- 5 - a first camera pair directed towards the teats of the milking animal when being located in the position to be milked, wherein the first camera pair is provided to repeatedly record pairs of images;
 - 10 - an image processing device provided for repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, characterized in that
 - 15 - said image processing device is provided in an initial stage to determine the absolute position of a teat of the milking animal in a coordinate system of the milking system; and
 - 20 - said image processing device is provided, in a later stage when the robot arm is close to attach a teat cup to the teat of the milking animal, to repeatedly determine the position of the teat of the milking animal relative to the robot arm or the teat cup, wherein
 - 25 - said the position of the teat of the milking animal relative to the robot arm or the teat cup is more exact than said absolute position.

2. The arrangement of claim 1 wherein said image processing device is provided, in the later stage when the robot arm is close to attach the teat cup to the teat of the milking animal, to repeatedly determine the relative position of the teat of the milking animal in a coordinate system of the camera pair; and to repeatedly detect the robot arm or the teat cup and determine its relative position in the coordinate system of the first camera pair by said stereoscopic calculation method based on said repeatedly recorded pairs of images.

10 3. The arrangement of claim 1 or 2 wherein

- said camera pair is provided to record a pair of images, wherein several well defined points are located in the common field of vision of the camera pair, the positions of the well defined points being known in the coordinate system of the milking system; and

- said image processing device is provided to perform an absolute calibration process, in which the positions of the image planes of the cameras of the camera pair are determined in the coordinate system of the milking system to thereby be capable of determining the absolute position of the teat of the milking animal.

4. The arrangement of any of claims 1-3 wherein

- said camera pair is provided to record a pair of images, wherein several well defined points are located in the common field of vision of the camera pair; and

- said image processing device is provided to perform a relative calibration process, in which the positions of the image planes of the cameras of the camera pair are determined relative to each other to thereby be capable of determining the position of

the teat of the milking animal relative to another measured position.

5. A method for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said method being characterized by the steps of:

- directing a first camera pair towards the teats of the milking animal when being located in the position to be milked;

- repeatedly recording pairs of images by the first camera pair;

15 - repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, wherein

20 - the absolute position of a teat of the milking animal is initially determined in a coordinate system of the milking system; and

25 - the position of the teat of the milking animal is determined relative to the robot arm or the teat cup repeatedly in a later stage when the robot arm is close to attach a teat cup to the teat of the milking animal, the position of the teat of the milking animal relative to the robot arm or the teat cup being more exact than said absolute position.

6. An arrangement for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a
5 control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said arrangement comprising:

- a camera pair directed towards the teats of the milking animal when being located in the position to be milked, wherein the
10 camera pair is provided to repeatedly record pairs of images;
- an image processing device provided for repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, characterized in that
- 15 - said camera pair is comprised of a pair of thermal or infrared cameras, each responsive to infrared radiation propagating towards the camera.

7. A method for determining positions of the teats of a milking animal in a milking system comprising a robot arm for
20 automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said method being characterized by the steps
25 of:

- directing a camera pair towards the teats of the milking animal when being located in the position to be milked;
- repeatedly recording pairs of images by the camera pair; and

- repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, wherein

5 - said camera pair is comprised of a pair of thermal or infrared cameras, each responsive to temperatures in the field of vision of the camera; and

- said repeatedly recorded pairs of images are thermal images.

8. An arrangement for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said arrangement comprising:

- a first camera pair directed towards the teats of the milking animal when being located in the position to be milked, wherein the first camera pair is provided to repeatedly record pairs of images;

20 - an image processing device provided for repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, characterized in that

- said first camera pair is mounted below the teats of, and
25 behind, the milking animal when being located in the position to be milked so that said first camera pair is directed diagonally upwards towards the teats of the milking animal when being located in the position to be milked.

9. The arrangement of claim 8 wherein the cameras of said first camera pair are movable relative to the milking system and to the milking animal when being located in a position to be milked, and optionally relative to each other, in order to be capable of reducing the number of failed teat position determinations due to teats being obscured, while pairs of images are recorded, by means of finding positions for said cameras where no teats are obscured.

10. The arrangement of claim 8 or 9 further comprising a third camera mounted adjacent said first camera pair mounted below the teats of, and behind, the milking animal, and directed towards the teats of the milking animal when being located in the position to be milked, for repeatedly record images simultaneously with the recording of said pairs of images, wherein said image processing device is provided for repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on one of said repeatedly recorded pairs of images and said repeatedly recorded images by said third camera.

11. The arrangement of claim 10 wherein said image processing device is provided for repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on another one of said repeatedly recorded pairs of images and said repeatedly recorded images by said third camera.

12. The arrangement of any of claims 8-11 further comprising a second camera pair directed towards the teats of the milking animal when being located in the position to be milked, wherein the second camera pair is provided to repeatedly record pairs of images, wherein said image processing device is provided for repeatedly detecting the teats of the milking animal and

determining their positions by a stereoscopic calculation method based on said pairs of images repeatedly recorded by said second camera pair.

13. The arrangement of claim 12 wherein said second camera pair
5 is mounted below the milking animal, particularly in the floor of the milking system, when being located in the position to be milked.

14. The arrangement of claim 12 wherein said second camera pair
10 is mounted at the side of the milking animal when being located in the position to be milked.

15. The arrangement of claim 14 wherein said second camera pair is mounted at a height so that the teats of the milking animal belong to the outer contour of the milking animal in the repeatedly recorded pairs of images.

16. The arrangement of claim 14 or 15 wherein said second camera pair is movable vertically in order to be positioned at a height so that the teats of the milking animal belong to the outer contour of the milking animal in the repeatedly recorded pairs of images.

17. The arrangement of any of claims 8-16 wherein said image processing device is provided in an initial stage to determine the absolute position of a teat of the milking animal in a coordinate system of the milking system; and

- said image processing device is provided, in a later stage
25 when the robot arm is close to attach a teat cup to the teat of the milking animal, to repeatedly determine the position of the teat of the milking animal relative to the robot arm or the teat cup, wherein . .

- the position of the teat of the milking animal relative to the robot arm or the teat cup is more exact than said absolute position.

18. The arrangement of claim 17 wherein said image processing
5 device is provided, in the later stage when the robot arm is close to attach the teat cup to the teat of the milking animal, to repeatedly determine the relative position of the teat of the milking animal in a coordinate system of the camera pair; and to repeatedly detect the robot arm or the teat cup and determine
10 its relative position in the coordinate system of the first camera pair by said stereoscopic calculation method based on said repeatedly recorded pairs of images.

19. The arrangement of claim 17 or 18 wherein

- said camera pair is provided to record a pair of images,
15 wherein several well defined points are located in the common field of vision of the camera pair, the positions of the well defined points being known in the coordinate system of the milking system; and

- said image processing device is provided to perform an
20 absolute calibration process, in which the positions of the image planes of the cameras of the camera pair are determined in the coordinate system of the milking system to thereby be capable of determining the absolute position of the teat of the milking animal.

25 20. The arrangement of any of claims 17-19 wherein

- said camera pair is provided to record a pair of images, wherein several well defined points are located in the common field of vision of the camera pair; and

- said image processing device is provided to perform a relative calibration process, in which the positions of the image planes of the cameras of the camera pair are determined relative to each other to thereby be capable of determining the position of the teat of the milking animal relative to another measured position.

21. A method for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said method being characterized by the steps of:

- 15 - directing a first camera pair towards the teats of the milking animal when being located in the position to be milked;
- repeatedly recording pairs of images by the first camera pair;
- repeatedly detecting the teats of the milking animal and
20 determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, wherein
- said first camera pair is arranged below the teats of, and behind, the milking animal when being located in the position
25 to be milked; and is directed diagonally upwards towards the teats of the milking animal when being located in the position to be milked.

22. An arrangement for determining positions of the teats of a milking animal in a milking system comprising a robot arm for

automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said arrangement comprising:

- a first camera pair directed towards the teats of the milking animal when being located in the position to be milked, wherein the first camera pair is provided to repeatedly record pairs of images;
- 10 - an image processing device provided for repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, characterized in that
- the cameras of said first camera pair are arranged vertically one above the other; and
- 15 - said image processing device is provided, for each teat and for each pair of images, to define the position of the lower tip of the teat contour in the pair of images as conjugate points for said stereoscopic calculation, and to find said conjugate points along a substantially vertical epipolar line.
- 20
- 23. The arrangement of claim 22 wherein said image processing device is provided, for each teat and for each pair of images, to compensate for any deviations caused by the fact that the lower tip of the teat contour in the pair of images corresponds to different objection points on the teat due to different perspective views, in which the pair of images are recorded, by means of creating a mathematical model of the characteristic form of the teat, and to calculate the compensation based on the
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mathematical model, the different perspectives, and the distance to the teat.

24. The arrangement of claim 23 wherein said image processing device is provided to determine the positions of the teats of the milking animal, and to calculate the compensation for any deviations caused by the fact that the lower tip of the teat contour in the pair of images corresponds to different objection points on the teat, in an iterative process.

25. The arrangement of any of claims 22-24 wherein said first camera pair is mounted below the teats of, and behind, the milking animal when being located in the position to be milked so that said first camera pair is directed diagonally upwards towards the teats of the milking animal when being located in the position to be milked.

26. The arrangement of claim 25 wherein the cameras of said first camera pair are movable relative to the milking system and to the milking animal when being located in a position to be milked, and optionally relative to each other, in order to be capable of reducing the number of failed teat position determinations due to teats being obscured, while pairs of images are recorded, by means of finding positions for said cameras where no teats are obscured.

27. The arrangement of any of claims 22-26 further comprising a third camera mounted adjacent said first camera pair, and directed towards the teats of the milking animal when being located in the position to be milked, for repeatedly record images simultaneously with the recording of said pairs of images, wherein said image processing device is provided for repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation

method based on one of said repeatedly recorded pairs of images and said repeatedly recorded images by said third camera.

28. The arrangement of claim 27 wherein said image processing device is provided for repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on another one of said repeatedly recorded pairs of images and said repeatedly recorded images by said third camera.

29. The arrangement of any of claims 22-28 further comprising a second camera pair directed towards the teats of the milking animal when being located in the position to be milked, wherein the second camera pair is provided to repeatedly record pairs of images, and said image processing device is provided for repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said pairs of images repeatedly recorded by said second camera pair.

30. The arrangement of claim 29 wherein said second camera pair is mounted below the milking animal, particularly in the floor of the milking system, when being located in the position to be milked.

31. The arrangement of claim 29 wherein said second camera pair is mounted at the side of the milking animal when being located in the position to be milked.

32. The arrangement of claim 31 wherein said second camera pair is mounted at a height so that the teats of the milking animal belong to the outer contour of the milking animal in the repeatedly recorded pairs of images.

33. The arrangement of claim 31 or 32 wherein said second camera pair is movable vertically in order to be positioned at a height so that the teats of the milking animal belong to the outer contour of the milking animal in the repeatedly recorded
5 pairs of images.

34. The arrangement of any of claims 22-33 further comprising at least one light source provided for illuminating the udder of the milking animal to thereby increase the contrast in the repeatedly recorded pairs of images.

10 35. The arrangement of claim 34 wherein said light source emits white light.

36. The arrangement of claim 34 wherein said light source emits UV light.

15 37. The arrangement of any of claims 34-36 wherein said light source creates a back lighting for said first camera pair.

38. The arrangement of any of claims 34-36 wherein said light source is movable and/or capable of being directed toward different directions.

20 39. The arrangement of any of claims 22-38 wherein the image planes of the cameras of said first camera pair are coplanar.

40. The arrangement of any of claims 22-39 wherein said image processing device is provided, for each time the teats are to be detected, to apply a motion detection algorithm to reduce the area in which the teats likely are, wherein the difference
25 between two images recorded one after the other by one camera of said camera pair is analyzed, and the area in which the teats likely are is reduced by discarding areas in the two images wherein substantially no movement has occurred.

41. The arrangement of claim 40 wherein said image processing device is provided to reduce scatter in the reduced area in which the teats likely are by applying a relaxation algorithm.

42. The arrangement of claim 40 or 41 wherein said image
5 processing device is provided to enlarge the reduced area in which the teats likely are by a pixel expanding algorithm.

43. The arrangement of any of claims 40-42 wherein

- said camera pair directed towards the teats of the milking animal when being located in the position to be milked is
10 directed so that the teats of the milking animal belong to the outer contour of the milking animal in the repeatedly recorded pairs of images; and

- said image processing device is provided to further reduce the area in which the teats likely are by a contour creation
15 algorithm.

44. The arrangement of any of claims 22-43 wherein said image processing device is provided, for each time the teats are to be detected, to apply an edge detection algorithm based on the phase congruency model of feature detection to thereby find
20 edges and corners in a recorded pair of images that most likely include those of the teats of the milking animal.

45. The arrangement of claim 44 wherein said image processing device is provided, for each time the teats are to be detected, to apply a Canny detection algorithm to thereby find edges in a
25 recorded pair of images that most likely include those of the teats of the milking animal.

46. The arrangement of claim 44 or 45 wherein said image processing device is provided, for each time the teats are to be

detected, to apply a labeling algorithm for calculating features of the found edges and corners in the recorded pair of images.

47. The arrangement of claim 46 wherein said image processing device is provided, for each time the teats are to be detected,
5 to apply a hierarchical chamfer matching algorithm for identifying edges and corners of the found edges and corners in the recorded pair of images which belong to the teats of the milking animal based on said calculated features.

48. The arrangement of any of claims 22-47 wherein said image
10 processing device is provided in an initial stage to determine the absolute position of a teat of the milking animal in a coordinate system of the milking system; and

- said image processing device is provided, in a later stage when the robot arm is close to attach a teat cup to the teat of
15 the milking animal, to repeatedly determine the position of the teat of the milking animal relative to the robot arm or the teat cup, wherein

- the position of the teat of the milking animal relative to the robot arm or the teat cup is more exact than said absolute
20 position.

49. The arrangement of any of claims 22-48 wherein said image processing device is provided to automatically detect the condition of the teats, particularly if they are swell up or if injuries and/or dirt subsist on the teats, of the milking animal
25 by an image processing method based on said repeatedly recorded pairs of images.

50. The arrangement of claim 49 wherein said injuries are any of wounds, cuts, sores, or red spots.

51. The arrangement of claim 49 or 50 wherein said milking system comprises at least one teat cleaning device capable of cleaning teats of milking animals according to anyone of a plurality of different teat cleaning schemes, said arrangement
5 comprising means provided to select one of said plurality of different teat cleaning schemes for the cleaning of the teats of said milking animal based on said automatic detection of the condition of the teats of said milking animal.

52. The arrangement of any of claims 22-51 wherein said image
10 processing device is provided to automatically detect dirt or damages on the lenses of said camera pair by an image processing method based on repeatedly recorded pairs of images.

53. The arrangement of claim 52 wherein said image processing device is provided, for each one of the cameras of said camera
15 pair, to automatically detect dirt or damages on the lens of that camera by an image processing method based on comparisons of repeatedly recorded images by that camera.

54. The arrangement of claim 52 or 53 wherein

- the cameras of said camera pair are rotatable to be capable
20 of being directed towards each other; and

- said image processing device is provided, for each one of the cameras of said camera pair, to automatically detect dirt or damages on the lens of that camera by an image processing method based on repeatedly recorded images by the other camera.

25 55. A method for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm

based on determined positions of the teats of the milking animal, said method being characterized by the steps of:

5 - directing a first camera pair towards the teats of the milking animal when being located in the position to be milked;

 - repeatedly recording pairs of images by the first camera pair;

10 - repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, wherein

 - the position of the lower tip of the teat contour in each pair of images is defined as conjugate points for said stereoscopic calculation; and

15 - the cameras of said first camera pair are arranged vertically one above the other, wherein the conjugate points are found, for each teat and for each pair of images, along a substantially vertical epipolar line.

20 56. An arrangement for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking
25 animal, said arrangement comprising:

 - a first camera pair directed towards the teats of the milking animal when being located in the position to be milked, wherein

the first camera pair is provided to repeatedly record pairs of images; and

- an image processing device provided for repeatedly detecting the teats of the milking animal and determining their positions
5 by a stereoscopic calculation method based on said repeatedly recorded pairs of images, characterized in that

- said image processing device is provided, for each time the teats are to be detected, to apply a motion detection algorithm to reduce the area in which the teats likely are, wherein the
10 difference between two images recorded one after the other by one camera of said first camera pair is analyzed, and the area in which the teats likely are, is reduced by discarding areas in the two images wherein substantially no movement has occurred.

57. The arrangement of claim 56 wherein said image processing
15 device is provided to reduce scatter in the reduced area in which the teats likely are by applying a relaxation algorithm.

58. The arrangement of claim 56 or 57 wherein said image processing device is provided to enlarge the reduced area in which the teats likely are by a pixel expanding algorithm.

20 59. The arrangement of any of claims 56-58 wherein

- said first camera pair is directed towards the teats of the milking animal when being located in the position to be milked is directed so that the teats of the milking animal belong to the outer contour of the milking animal in the repeatedly
25 recorded pairs of images; and

- said image processing device is provided to further reduce the area in which the teats likely are by a contour creation algorithm.

60. The arrangement of any of claims 56-59 wherein said image processing device is provided, for each time the teats are to be detected, to apply an edge detection algorithm based on the phase congruency model of feature detection to thereby find
5 edges and corners in a recorded pair of images that most likely include those of the teats of the milking animal.

61. The arrangement of claim 60 wherein said image processing device is provided, for each time the teats are to be detected, to apply a Canny detection algorithm to thereby find edges in a
10 recorded pair of images that most likely include those of the teats of the milking animal.

62. The arrangement of claim 60 or 61 wherein said image processing device is provided, for each time the teats are to be detected, to apply a labeling algorithm for calculating features
15 of the found edges and corners in the recorded pair of images.

63. The arrangement of claim 62 wherein said image processing device is provided, for each time the teats are to be detected, to apply a hierarchical chamfer matching algorithm for identifying edges and corners of the found edges and corners in
20 the recorded pair of images which belong to the teats of the milking animal based on said calculated features.

64. A method for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking
25 animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said method being characterized by the steps of:

- directing a first camera pair towards the teats of the milking animal when being located in the position to be milked;

- repeatedly recording pairs of images by the first camera pair;

5 - repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, wherein

10 - a motion detection algorithm is applied each time the teats are to be detected to reduce the area in which the teats likely are, in which the difference between two images recorded one after the other by one camera of said first camera pair is analyzed, and the area in which the teats likely are, is reduced by discarding areas in the two images wherein substantially no
15 movement has occurred.

65. An arrangement for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a
20 control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said arrangement comprising:

- a first camera pair directed towards the teats of the milking animal when being located in the position to be milked, wherein
25 the first camera pair is provided to repeatedly record pairs of images;

- an image processing device provided for repeatedly detecting the teats of the milking animal and determining their positions

by a stereoscopic calculation method based on said repeatedly recorded pairs of images, characterized in that

5 - said image processing device is provided, for each time the teats are to be detected, to apply an edge detection algorithm based on the phase congruency model of feature detection to thereby find edges and corners in a recorded pair of images that most likely include those of the teats of the milking animal.

10 66. The arrangement of claim 65 wherein said image processing device is provided, for each time the teats are to be detected, to apply a Canny detection algorithm to thereby find edges in a recorded pair of images that most likely include those of the teats of the milking animal.

15 67. The arrangement of claim 65 or 66 wherein said image processing device is provided, for each time the teats are to be detected, to apply a labeling algorithm for calculating features of the found edges and corners in the recorded pair of images.

20 68. The arrangement of claim 67 wherein said image processing device is provided, for each time the teats are to be detected, to apply a hierarchical chamfer matching algorithm for identifying edges and corners of the found edges and corners in the recorded pair of images which belong to the teats of the milking animal based on said calculated features.

25 69. A method for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking

animal, said method being characterized by the steps of:

- directing a first camera pair towards the teats of the milking animal when being located in the position to be milked;

5 - repeatedly recording pairs of images by the first camera pair;

- repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images,

10 wherein

- an edge detection algorithm based on the phase congruency model of feature detection is applied each time the teats are to be detected to thereby find edges and corners in a recorded pair of images that most likely include those of the teats of the milking animal.

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70. An arrangement for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said arrangement comprising:

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- a first camera pair directed towards the teats of the milking animal when being located in the position to be milked, wherein the first camera pair is provided to repeatedly record pairs of images;

25

- an image processing device provided for repeatedly detecting the teats of the milking animal and determining their positions

by a stereoscopic calculation method based on said repeatedly recorded pairs of images, characterized in that

- said image processing device is provided to automatically detect a condition of the teats of the milking animal by an image processing method based on said repeatedly recorded pairs of images.

71. The arrangement of claim 70 wherein said image processing device is provided to automatically detect injuries and/or dirt on the teats of the milking animal by an image processing method based on said repeatedly recorded pairs of images.

72. The arrangement of claim 71 wherein said injuries are any of wounds, cuts, sores, or red spots.

73. The arrangement of claim 70 wherein said image processing device is provided to automatically detect if a teat of the milking animal is swell up by an image processing method based on said repeatedly recorded pairs of images.

74. The arrangement of any of claims 70-73 wherein said milking system comprises at least one teat cleaning device capable of cleaning teats of milking animals according to anyone of a plurality of different teat cleaning schemes, said arrangement comprising means provided to select one of said plurality of different teat cleaning schemes for the cleaning of the teats of said milking animal based on said automatic detection of the condition of the teats of said milking animal.

75. The arrangement of any of claims 70-74 wherein said image processing device is provided to automatically detect dirt or damages on the lenses of said first camera pair by an image processing method based on repeatedly recorded pairs of images by said first camera pair.

76. The arrangement of claim 75 wherein said image processing device is provided, for each one of the cameras of said first camera pair, to automatically detect dirt or damages on the lens of that camera by an image processing method based on
5 comparisons of repeatedly recorded images by that camera.

77. The arrangement of claim 75 or 76 wherein

- the cameras of said first camera pair are rotatable to be capable of being directed towards each other; and

- said image processing device is provided, for each one of the
10 cameras of said first camera pair, to automatically detect dirt or damages on the lens of that camera by an image processing method based on repeatedly recorded images by the other camera.

78. A method for determining positions of the teats of a milking animal in a milking system comprising a robot arm for
15 automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said method being characterized by the steps
20 of:

- directing a first camera pair towards the teats of the milking animal when being located in the position to be milked;

- repeatedly recording pairs of images by the first camera pair;

25 - repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, wherein

- injuries and/or dirt on the teats of the milking animal are automatically detected by an image processing method based on said repeatedly recorded pairs of images.

79. An arrangement for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said arrangement comprising:

- a first camera pair directed towards the teats of the milking animal when being located in the position to be milked, wherein the first camera pair is provided to repeatedly record pairs of images;
- 15 - an image processing device provided for repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, characterized in that
- said image processing device is provided to automatically
20 detect dirt or damages on the lenses of said first camera pair by an image processing method based on repeatedly recorded pairs of images by said first camera pair.

80. The arrangement of claim 79 wherein said image processing device is provided, for each one of the cameras of said first camera pair, to automatically detect dirt or damages on the lens
25 of that camera by an image processing method based on comparisons of repeatedly recorded images by that camera.

81. The arrangement of claim 79 or 80 wherein

- the cameras of said first camera pair are rotatable to be capable of being directed towards each other; and

- said image processing device is provided, for each one of the cameras of said first camera pair, to automatically detect dirt or damages on the lens of that camera by an image processing
5 method based on repeatedly recorded images by the other camera.

82. A method for determining positions of the teats of a milking animal in a milking system comprising a robot arm for automatically attaching teat cups to the teats of a milking
10 animal when being located in a position to be milked, and a control device for controlling the movement of said robot arm based on determined positions of the teats of the milking animal, said method being characterized by the steps of:

15 - directing a first camera pair towards the teats of the milking animal when being located in the position to be milked;

- repeatedly recording pairs of images by the first camera pair;

20 - repeatedly detecting the teats of the milking animal and determining their positions by a stereoscopic calculation method based on said repeatedly recorded pairs of images, wherein

- dirt or damages on the lenses of said first camera pair is/are automatically detected by an image processing method based on
25 repeatedly recorded pairs of images by said first camera pair.